

CCE Awards 2023

Restoration of the Recreation Bay and Tekakwitha Island in Kahnawà:ke

Firm:
AECOM Consultant Inc.

Client(s):
Mohawk Council of Kahnawà:ke

Collaborators:
Kahnawà:ke Environment Protection Office (KEPO),
Rice Mohawk Landscaping (RML Landscaping),
GEO Morphix Ltd,
ECO Technologies Ltd, AFFM inc., Écogénie



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Project Summary

The construction of the St. Lawrence Seaway led to the creation of Tekakwitha Island by disposing of the excavated rock and clay to connect and overfill a series of existing natural islands, leading to the formation of Tekakwitha Island and the Recreation Bay. AECOM was commissioned by the Mohawk Council of Kahnawà:ke (MCK) to prepare the detailed design and construction approach to improve water flow through the bay, create two wildlife habitats, restore degraded shorelines and enhance community use through well-integrated accesses to the bay, rest areas and a public beach. These improvements have enhanced opportunities for traditional and recreational activities for community members and for wildlife.

Highlights

- As soon as they were completed, the two natural habitats were used by wildlife. Turtle nests and eggs were found in the area designed for that purpose and the artificial nesting structure was used by Bank swallows two weeks after it was in place.
- The community have increased opportunities for fishing, swimming, and paddling. Families and friends are gathering at the beach to relax, have fun and enjoy barbecues.

View of the Recreation Bay

Photo credit: AECOM



Canada geese with their young

Photo credit: AECOM



Nesting structure for the Bank swallow

Photo credit: KEPO



Turtle nest and eggs

Photo credit: AECOM



Turtle sun basking in the wetland complex

Photo credit: AECOM



1. Innovation

Recreation Bay is located between the north shore of Kahnawà:ke and Tekakwitha Island. The reduced flowrate in the bay since the construction of the St. Lawrence Seaway has resulted in progressive sedimentation while the nutrient rich deposits promoted excessive aquatic plant growth and increased eutrophication. In addition, traditional fishing, swimming, and boating activities have been impacted by these conditions, particularly during low water conditions.

Dredging shoal areas and harvesting aquatic plants were two measures identified to increase water flow. Based on sediment characterization and after discussion with MCK, AECOM recommended the use of hydraulic dredging and transport of a sediment slurry to an area on land for consolidation in dewatering bags. However, the contractor proposed an innovative technic to dewater sediments in a more efficient and cost-effective manner. Because of the amount of space available and the excavation required for the creation of the linear pond and marsh feature, a series of basins were created to manage the slurry. Coagulants were added at various stages to progressively remove the sediment from the water column. The overflow was then passed through a polishing channel with additional additives to clump remaining sediment which was then settled in a final chamber. The geology of the island was then

utilized as a final polishing step with discharge water infiltrating through the island and emerging back in the bay, with no detectable sediment remaining. Redundant sediment basins were available so that when one was full, it could be taken offline. This sediment was then excavated out and placed in other containment areas for further dewatering. The quality of the sediment was suitable for reuse, and this was accomplished by mixing the dewatered sediment with sand at a 1.5 sand to 1 sediment ratio, creating topsoil for use in the constructed habitat features. This process decreased the dewatering time required and ensured topsoil was available to complete project elements in a timely manner.

To maximize flow velocity and sediment movement through the bay and protect wetlands and wildlife at the same time, aquatic plants were harvested in a defined channel of 54,800 m² located between the dredging area and the St. Lawrence Seaway. AECOM recommended a plant harvesting strategy based on water depth, plant density and surface area, as well as the best equipment to use in the specific context of the bay with the least adverse impacts to fish and turtle habitats, emergent grass beds and shorelines. The timing to proceed with plant harvesting needs to match optimal water level conditions and plant heights in areas to be harvested.

Dredging worksite

Photo credit: GEO Morphix



Silt curtain sequesters sediment during dredging operation

Photo credit: GEO Morphix



Aquatic plant harvester in action in the bay

Photo credit: GEO Morphix



2. Complexity

Amongst the challenges encountered were:

The complexity of this project was in the sequencing of the restoration activities to allow the protection of fauna species during their reproduction periods or hibernation and to optimise the recuperation and reuse of material from the restoration activities. This included the dredged sediment to produce topsoil and big flat rocks from the storm sewer outfalls and excavated on the island to create stairs in access areas, fire pits and natural barriers to vehicular access.

Since most of Tekakwitha Island is composed of excavated rocks of all sizes and clay from the St. Lawrence Seaway, another challenge was the unpredictability of the soil where excavation was needed. During the creation of the two natural zones and profiling of the shoreline, many times

the contractor came across big rocks which led to large hole that needed to be filled to reach the right elevation when they were removed or to a higher elevation if they were left in place. Depending on the location and the importance to reach the right elevation, decisions were made in the field to allow the contractor to remove these or leave them in place.

The restoration project involved planting a total of 14,220 plants. These include 690 trees, 8,540 shrubs and 4,990 submerged and emergent aquatic plants which were mostly distributed in the two natural zones, the five accesses and the beach. The coordination involved for the purchase, on-site maintenance, and planting was a challenge skillfully met by the contractor with the collaboration of KEPO and AECOM.

The rocky nature of the soil was challenging during excavations

Photo credit: AECOM



3. Social and/or Economic Benefits

After the preliminary design was completed, an Open House and a kiosk were held to gather feedback, comments, and suggestions from the community on proposed design components to incorporate. Public participation was a key element for project acceptance. It made community members more aware of the improvements which increased opportunities to incorporate elements to enhance traditional and recreational activities.

Since the bike path passes along the bay through the new natural habitats, community members can reconnect with nature, enjoy the beauty and tranquility of these habitats, and present opportunities to observe wildlife attracted by specific features such as the artificial nesting structure for the Bank Swallow.

AECOM provided informal mentoring to some KEPO and contractor employees by showing them plantation techniques and discussing specific species needs in relation with the water level and their groupings to form various wetlands including submerged aquatic grass beds, marshes, wet meadows, shrub swamps and terrestrial habitat.

The topsoil made by mixing the dewatered sediment and sand for use in the constructed habitat features reduced the projects costs significantly by avoiding the need for sediment disposal and the purchase of imported topsoil, as well as associated transportation costs. It also gave a second life to the dredged sediment, which is in line with the principles of sustainable development.

Mixing dewatered sediment with sand

Photo credit: AECOM

Open House for community awareness

Photo credit: AECOM



4. Environmental Benefits

Two natural zones were created on Tekakwitha Island. The first being a turtle nesting ground habitat, of 1.3 ha consisting of a marsh, turtle beach, and scrubland where an adapted seed mixture was sown and about 2,000 shrubs and trees were planted. Rocks of various size provided shelters for the Northern Brownsnake. The second natural zone of 2.4 ha was a wetland complex including a marsh, wet meadow and shrub swamp surrounded by a diverse terrestrial habitat, in which 10,500 plants, consisting of some 55 species, were planted. A deep-water linear pond was excavated in the wetland to ensure permanent water.

To ensure the perennity of these natural zones, the daily fluctuations of the water level were analysed over a period of 58 years to establish the elevation of each type of wetland. Diverse plant species increase the biodiversity of the area and provide opportunities for food, shelter, and reproduction. The main ecological functions are expected to be fully realized after a few years.

The artificialized shores of Recreation Bay have colonized naturally with species typical of disturbed open habitats. The shorelines were characterized, and optimized interventions were based on shoreline quality to restore only portions in poor condition by controlling, removing, or replacing unwanted vegetation with a more typical and functional riparian vegetation, while maintaining and protecting shoreline portions in good condition. In various locations, access between the bay and the island were improved to facilitate movement by wildlife and community members.

Mitigation measures, such as silt curtain and exclusion fences, were deployed during dredging and excavation activities to protect wildlife and adjacent environment. The overall restoration project incorporated principles of sustainable development, with a focus on removing invasive species, minimizing environmental impacts and disturbances and reusing materials where possible.

Turtle nesting ground before development

Photo credit: GEO Morphix



Turtle nesting ground after development

Photo credit: GEO Morphix



Wetland complex during development

Photo credit: GEO Morphix



Wetland complex after development

Photo credit: GEO Morphix



Degraded shorebank

Photo credit: AECOM



5. Meeting Client's Needs

The construction of the St. Lawrence Seaway in the 1950's resulted in a progressive degradation and eutrophication of the Recreation Bay, reducing the practicality and desirability of fishing and recreational activities. Dredging the sediments and harvesting excessive aquatic plants in a specific channel in the bay improved water flow and enhanced community experience.

AECOM designed several restoration elements to improve degraded shorelines by replacing unwanted vegetation with more typical riparian vegetation resulting in an increase of biodiversity and wildlife habitats. Other elements were intended to build safe access to the bay for fishing activities, rest areas to embrace the quiet nature of the bay, and a public beach for family gathering and children to play. The creation of two large natural habitats enhanced the ecological value of the island by replacing the original flat land colonized with species typical of disturbed open habitats by planting stands of the bioclimatic domain, including sugar maple-hickory stands, typical of the Montreal

region and the St. Lawrence Lowlands. Finally, the integrity of the two pristine existing wetlands was enhanced by eliminating colonies of exotic invasive species, changing its topography to enlarge the forested swamp and increase its biodiversity.

AECOM worked closely with the client (MCK and KEPO), the site supervisor (GEO Morphix) and the contractor (RML Landscaping) who appreciated AECOM's presence and availability in the field to quickly find solutions to raised issues.

Safe access to the bay were built

Photo credit: KEPO



Public beach for family gathering and children to play

Photo credit: GEO Morphix



About AECOM

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